BOTANICAL RESULTS OF THE ARCHBOLD EXPEDITIONS NEW AND NOTEWORTHY PAPUAN SCROPHULARIACEAE. II.

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Through the kindness of Dr. E. D. Merrill of Harvard University there has been submitted for my study a further series of specimens collected in Papua by Mr. L. J. Brass, under a second expedition conducted to that little-known country by Mr. Richard Archbold in association with the American Museum of Natural History. Most of these were gathered between September and November, 1936 along the lower and middle course of the Fly River. This, the largest stream in New Guinea, lies in western Papua and so about the middle of the southern side of the island. This portion of New Guinea is situated just opposite Cape York, which terminates the northeastern extension of Queensland, and thus is geographically not far away from the Australian continent. For a map of this region see Jour. Arnold Arb. **19**: 174. 1938.

The plants gathered are all from low altitudes. In my previous paper[1] I stressed the sharp contrast between the lowland and highland Scrophulariaceae in New Guinea, a difference which had been noticed earlier by Dr. Schlechter. Among the earlier Archbold collections only a specimen of *Buchnera* had appeared out of its expected elevation, but Mr. Brass has since assured me that there had been an error in transcribing his record of altitude, for the specimen actually came from 1500, and not 2840 meters above the sea.[2] The plants of the second collection are all characteristic members of the lowland scrophulariaceous flora.

Some of these plants are widespread Indo-Malayan species, adding more representatives of the class that was so dominant in the former series of Archbold Papuan plants. Among those now first reported the most striking is *Artanema longifolium*, of which I have seen no previous record from east of Wallace's Line. But others are species long known from tropical northeastern Australia, where there exists a small group of supposedly endemic members of the family. Probably all of these

[1]Brittonia **2**: 177-188. 1936.
[2]Correction made in Brittonia **3**: 95. 1938.

will prove to be present also in southern New Guinea, since otherwise Australia is nearly lacking in Scrophulariaceae. To the extensive number of Indo-Malayan plants of this family, which have clearly extended eastward as discussed in my preceding paper, should be added this smaller group of Austro-Malayan plants, a group that must prove to be ultimately, though more remotely, also of Indo-Malayan origin.

As so little is known of the flora of the Fly River valley it seems worthwhile to record all the species of this small collection of Scrophulariaceae. As in the previous list, they are inserted under the generic and specific numbers of Schlechter's "Die Scrophulariaceen Papuasiens,"[3] and the species and genera now first reported from New Guinea are noted by an asterisk. The addition of these makes a new total for the island of 28 lowland and 13 alpine species of Scrophulariaceae, but I confidently expect to see this proportion reversed when more of the difficult mountain areas have been botanically explored.

1. **Limnophila** R. Br.

3. **L. aromatica** (Lam.) Merr. Interpret. Rumph. Herb. Amb. 466. 1917.

Lake Daviumbu, Middle Fly River, plentiful in grassy shallows of swamps and lagoons, *Brass* 7532; flowers puce-colored.

2. **Adenosma** R. Brown

To the two species enumerated by Schlechter is to be added the following, remarkable for its ternate instead of opposite phyllotaxy. It seems to be akin to both *A. coeruleum* R. Br.[4] and *A. papuanum* Schlechter, resembling them in habit, but differing in ternate phyllotaxy, lack of glandularity, inflorescence more spike-like, its upper sepal less conspicuously enlarged, its upper corolla-lobes distinct at apex, and its seeds narrower. It further differs from current descriptions of *Adenosma* in the hairiness of the landing-stage of the lower lip, but this is likely to prove an overlooked generic character.[5] Of course such hairs are part of the floral mechanism, helping the bee to alight on the expanded lower lip and so to enter the flower in erect posture.

[3] Bot. Jahrb. **59**: 99-117. 1924.

[4] R. Brown, Prodr. **1**: 442. 1810. Figured in Banks and Solander, Illustr. Bot. Cook's Voy. **2**: *t. 218*. 1901, and described in the accompanying text (p. 66).

[5] Although its localization was not realized, this hairiness was evidently meant by the phrase "tubus . . . interne pilosiusculus" in the description accompanying Banks and Solander's plate.

*3. **A. ternatum** Pennell, sp. nov.

Herba perennis (?), 5–10 dm. alta, ramosa; caulis et rami teretiusculi, hirsuti, eglandulosi; folia ternata, petiolata, triangulari-ovata, obtusa, basi cuneata, margine crenato-dentata, utrinque hirsuto-pubescentia, lamina 2–2.5 cm. longa, infra medium 1.5–2.3 cm. lata, petiolo 4–9 mm. longo; flores inferiores plus minusve remoti, alii in racemum spiciformem congesti; bracteolae duae, lineares, calyce breviores; sepala inaequalia, lanceolata vel lineari-lanceolata, 4–6 mm. longa; corolla 10 mm. longa, tubulosa, bilabiata, violaceo-caerulea, extus glabra, labio supero apice bifido, labio infero villoso, trilobato, lobis retusis; stamina 4, glabra, inclusa, filamentis inferis longioribus, connectivis globosis, et antherarum superarum cellulis aequalibus, sed inferarum uno rudimento inaequalibus; capsula 7–8 mm. longa, nigra, latere ad septum sulcata, loculicida et tardius etiam septicida; semina 0.4 mm. longa, cylindrica, rugoso-reticulata.

Herb apparently perennial,[6] 5–10 dm. tall or more, short-branched above, hirsute throughout but not glandular. Stem and branches teretish, laxly or densely foliate. Leaves ternate, petiolate, triangular-ovate (wider than in *A. coeruleum*), obtuse, at base cuneate, margin crenate-dentate, hirsute-pubescent on both surfaces or beneath, mainly so on the prominent veins, blades 2–2.5 cm. long, below the middle 1.5–2.3 cm. wide, petiole 4–9 mm. long. Lower flowers somewhat isolated, the upper forming a short spike-like raceme; lower bracts leaf-like, upper oblanceolate, about equaling the sepals. Pedicels 1–2 mm. long. Bractlets 2, linear, shorter than the calyx. Sepals unequal, lanceolate or linear-lanceolate, 4–6 mm. long. Corolla 10 mm. long, tubular-bilabiate, violet-blue (without record of pattern), externally glabrous; upper lip projecting-arched, its lobes rounded, distinct at apex;[7] lower lip 2-ridged and villose, distally with three retuse lobes. Filaments four, included, glabrous, the anterior pair slightly longer; connective knob-like; postero-laterals with two nearly equal anther-cells, antero-laterals with only one anther-cell, the other a mere rudiment. Stigmas wide, plate-like, or perhaps arc-like at the apex of such fused plates, which make the distal portion of the fused styles broadly winged. Capsule 7–8 mm. long, black, firm, laterally furrowed on septum (as in *Sophronanthe*), distally attenuate, loculicidal and secondarily somewhat septicidal. Seeds 0.4 mm. long, cylindric, brown, rugose-reticulate.

[6]As suggested by the broken base of No. 7816. If so, this forms a strong contrast with *Adenosma coeruleum* and *A. papuanum*.

[7]Upper lip drawn as with entire apex on Banks and Solander's plate, and so described in the accompanying text of *Adenosma coeruleum*.

Type, savannas, Lake Daviumbu, Middle Fly River, Papua, collected in flower and fruit in September, 1936, by *L. J. Brass,* no. 7816, and deposited in Herb. Academy of Natural Sciences of Philadelphia. The plant was reported as "abundant on ground grazed short and trampled by wallaby". More leafy specimens, not yet in blossom, were found occurring as common weeds in old deserted gardens at Mabaduan, Western Division, Papua, where gathered in April, 1936, by *Brass,* no. 6574.

3. **Torenia** Linnaeus

1. **T. polygonoides** (Benth.) Benth., Scroph. Ind. 39. 1835.

Lake Daviumbu, Middle Fly River, on leafy ground near edge of swamp in rain-forest, *Brass* 7551; flowers pink. A wide-spread Indo- and Austro-Malayan species.

*3a. **Artanema** D. Don

The large growth, with accompanying large purple flowers and elongated leaves, distinguishes this genus at once from other Oriental and Australian Gratioleae. The enlarged knob-like outgrowths of the lower pair of filaments are also distinctive. As in *Lindernia,* these knobs are clearly caused by a folding of the filaments, the conducting tissue passing through them as a loop on its way to the anthers.

*1. **A. longifolium** (L.) Vatke, Linnaea **43**: 307. 1882.

East bank of lower Fly River, opposite Sturt Island, collected in flower October, 1936, by *L. J. Brass,* no. 8143. A wide-spread Indo-Malayan, and evidently also Austro-Malayan, species.

In the collection at hand the leaves reach at least 15 cm. long and 2 cm. wide, while the lower ones were perhaps still larger. The blades are remotely serrate with low teeth, so that both in form and margin they contrast with the plant shown as this species on Tab. 8687 of Botanical Magazine in 1916. However, both Bentham's and Hooker's accounts of it speak of the leaves as varying from entire to serrate, while Linnaeus' description of *Columnea longifolia*[8] gave the leaves as very long and subserrate, a characterization perfectly fitting our specimen.

The species has had a checkered nomenclatural history. It was first considered generically distinct by Vahl, who in 1791[9] constituted it his

[8]Mant. Pl. 90. 1767.
[9]Symb. Bot. **2**: 71. 1791.

genus *Achimenes,* calling this species *A. sesamoides,* but including *Columnea longifolia* in synonymy. Because antedated by *Achimenes* P. Browne of the Gesneriaceae, this genus lapsed. In 1835 David Don based his genus *Artanema* on the Australian *Torenia fimbriata* Hook., and in 1835 Bentham added to it the present species as *A. sesamoides* (Vahl), still including *Columnea longifolia* in synonymy. Although not recorded by the "Index Kewensis," the combination *Artanema longifolium* was actually proposed by Vatke in 1880-82,[10] as indicated by S. A. Skan in 1916,[11] although it has been credited usually either to Wettstein in 1891,[12] or to Merrill in 1923.[13]

Since the leaf-blades of *Artanema longifolium* appear to be so variable in width and degree of cutting, it is likely that A. *angustifolium* Benth.[14] from Singapore will prove to be merely a narrow-leaved extreme. In such forms, as in the present collection from Papua, the basal narrowing of the leaf-blade fails to become petiolar.

4. **Lindernia** Allioni

The second Archbold series includes 5 species of this genus, in which, as previously explained, *Ilysanthes* is also included. One species is proposed as new to science, and for another Dr. Merrill has called attention to a specific name older than that which Dr. Schlechter and I employed.

1. **L. crustacea** (L.) F. V. Muell. Census 97. 1882.

Collections of this wide-spread weed were made at Palmer River (*Brass* 7086) and Lake Daviumbu, Middle Fly River (*Brass* 7537).

*1a. **L. crenata** Pennell, sp. nov.

Herba annua, 2–3 dm. alta, laxe ramosa; caulis et rami ad nodos pilosi; folia ovata, obtusa, basi cuneata, crenata, utrinque pilosa, petiolata, laminis 2–2.5 cm. longis, 0.8–1.2 cm. latis, petiolis hirsutis, 3–5 (infimis 8) mm. longis; pedicelli 15–20 mm. longi, divaricati; bracteolae nullae; sepala 5, lanceolata, attenuata, hirsuta, 7 mm. longa; corolla 7–8 mm. longa, violacea, extus glabra, labio supero concavo lobis rotundatis fere integro, labio infero explanato, trilobato, lobis rotundatis vel retusis; stamina 4, glabra, inclusa, antheris inferis

[10]Linnaea **43**: 307. 1882.
[11]Bot. Mag. **142**: t. 8687. 1916.
[12]Nat. Pflanzenfam. iv. **3b**: 79. 1891 as "A. longiflorum (L.) Wettst."
[13]Enum. Philip. Flow. Pl. **3**: 436. 1923.
[14]DC. Prodr. **10**: 408. 1846.

minoribus rudimentis; capsula 4 mm. longa, brunnea, in calyce inclusa, septicida, septo persistente; semina 0.3 mm. longa, turgida, alveolato-reticulata.

Stems 2–3 dm. tall, ascending or erect, laxly branched, pilose near the nodes, the internodes longer than the leaves. Leaves opposite: blades ovate, 2–2.5 cm. long, 8–12 mm. wide, obtuse, crenate, slightly paler beneath, somewhat pilose on both surfaces, especially on the main veins, the blades abruptly cuneately narrowed to the short hirsute petioles, 3–5, or the lowermost 8 mm. long. Bracts leaf-like, but acute to acuminate and reduced, 1.3–1.7 cm. long. Pedicels 15–20 mm. long, divaricately spreading. Bractlets none. Sepals five, lanceolate, attenuate, hirsute, the upper three slightly longer, 7 mm. long, all more or less united proximally but eventually becoming distinct, or the two lower tending to cohere permanently. Corolla 7–8 mm. long, violet;[15] upper lip broadly arched, with rounded lobes that unite nearly to apex; lower lip slightly spreading, its free lobes shortly rounded or retuse, proximally the base of the lower lip and the throat anteriorly with two slightly puberulent ridges, the corolla elsewhere glabrous. Free postero-lateral filaments incurved, short, arising distad to the middle of the corolla, the proximal portion being so completely fused with the corolla-tube as not to be evident above its surface; their anthers approximate (with cells contiguous in form of St. Andrews' Cross), the connective loosely dilated and extending much below the lower anther-cell.[16] Antero-lateral filaments fused with and partially forming the antero-lateral ridges of the corolla, each distally forming a pyriform-cylindric knob from the base of which arises a short free filament which bears a rudimentary 2-celled anther. Stigmas distinct, lamellate, within the upper lip. Capsule 4 mm. long, ellipsoid, brown, enclosed within calyx, dehiscing septicidally, with the septum persisting as a thin plate. Seeds turgid, irregularly globose, 0.3 mm. long, yellow, with shallowly alveolate reticulations.

Type, common on wet grass plains, Lake Daviumbu, Middle Fly River, Papua, collected in flower and fruit September, 1936 by *L. J. Brass,* no. 7824; in Herb. Academy of Natural Sciences of Philadelphia. Only collection seen.

Probably the kinship of this species is in the Section *Torenioides,* as indicated by the shape and surface-markings of the seeds, the lack of

[15]Recorded as "purple," but the corolla-lobes still show violet, and this or blue-violet is the prevalent color in *Lindernia.* Within the throat anteriorly and proximally yellow coloration is still apparent, and I do not doubt that this species really shows the elaborate color-pattern usual in the genus.

[16]Placed parallel to it, not transversely as in *Gratiola.*

apiculation on the capsule, and the somewhat united sepals. From other members of the group it differs in erect habit and especially in reduction of the anthers of the anterior stamens. In fact, the state of the latter forms an excellent gradation between the old concepts of *Lindernia,* with all the four stamens perfect, and *Ilysanthes,* with the anterior pair of filaments lacking anthers.

2. **L. pusilla** (Thunb.) Merr. Philipp. Jour. Sci. Bot. **11**: 312. 1916.

Lake Daviumbu, Middle Fly River, carpeting small grassless patches on wet savannahs, *Brass* 7882; flowers cream-colored.

5. **L. antipoda** (L.) Alston, Fl. Ceylon **6**: 214. 1931.

Gaima, east bank of Lower Fly River, massed in semi-shade on tidal fore-shores, fresh-water, *Brass* 8318; flowers lavender-colored.

Dr. Merrill has called my attention to the fact that *Gratiola veronicaefolia* Retz. (1810) is a synonym of *Ruellia antipoda* L. (1753), as has been explained by him in his "Interpretation of Rumphius' Herbarium Amboinense" of 1917, where he made the combination *Ilysanthes antipoda* (L.) Merr. (p. 467). Transferred to *Lindernia,* this becomes *L. antipoda* (L.) Alston, Fl. Ceylon **6**: 214. 1931, a name that should replace *L. veronicaefolia* (Retz.) F. V. Muell. in my paper of 1936.

On consulting Alston's volume, I was interested to see that, although without discussion, he had there united under *Lindernia* the different genera which I subsequently brought together in 1935. This course is so logical, that I am not surprised that we have both adopted it independently.

7. **L. ruellioides** (Koenig) Pennell, Brittonia **2**: 182. 1936.

Palmer River, two miles below junction of Black River, sunny positions on rocks swept by river flood-waters, alt. 100 m., *Brass* 7085; flowers lavender-colored.

7. **Centranthera** R. Brown[17]

1. **C. cochinchinensis** (Lour.) Merr. Trans. Amer. Philos. Soc. II. **24**: 353. 1935.

[17]Dr. Merrill accepted *Razumovia* Sprengel (1807) in place of *Centranthera* R. Brown (1810), as the oldest valid generic name for this group, following Britten and Alston; see Bull. Torr. Bot. Club **64**: 589-598. 1937. He now calls my attention to the fact that Sprengel actually published *Razumovia* for an entirely different group of the Compositae in 1805, not in 1826 as listed in current literature. *Razumovia* Spreng. Allgem. Lit.-Zeit. Intelligenzbl. 136. 1805 is a synonym of *Humea* Smith (1804), but this publication invalidates the use of the same generic name for the very different *Razumovia* Spreng. 1807 = *Centranthera* R. Brown. He has reconsidered the case, abandoning *Razumovia* Spreng. and reinstating *Centranthera* R. Br. for the scrophulariaceous genus.

As explained by Dr. Merrill,[18] *Digitalis cochinchinensis* of Loureiro's "Flora Cochinchinensis" (p. 353) of 1790 antedates *Centranthera hispida* R. Br. of 1810, the name which Schlechter and I have used for the species.

In addition to the two stations cited in 1936 are the following records from the Fly River: Lake Daviumbu, Middle Fly River, common on savannahs, *Brass* 7815; and Gaima, Lower Fly River, in open savannah-forests, common and conspicuous, *Brass* 8270. Both note "flowers yellow."

8. **Buchnera** Linnaeus

*2. **B. urticifolia** R. Br. Prodr. **1**: 437. 1810.

The following collections seem to pertain to this Australasian and East Indo-Malayan species. After citing eight specimens from northeastern and one from southwestern New Guinea and also one from the Bismarck Archipelago, Schlechter states that what he has seen differs from *B. urticifolia* in the usual very thick hairy indumentum of the inflorescence-rhachis and the larger flowers. But our plants from southeastern New Guinea have only moderate or short hairs on the rhachis or are essentially glabrous through the inflorescence, while the flowers are small (8–11 mm. long). Moreover, the corollas are uniformly glabrous externally, and not variable in hairiness as stated by Schlechter. Clearly, there are two species in New Guinea, of which ours accords closely with *B. urticifolia*, the common plant of northern Queensland in northeastern Australia.

Whether our specimens all pertain to the very same species is doubtful. All are recorded as bearing pink flowers. The five collections seen differ as follows, the distinctions being possibly mere local variations or perhaps denoting specific or subspecific trends:

A. Inflorescence throughout finely pubescent.

B. Plant 10–15 dm. tall, the middle cauline leaves ample, 5–7 cm. long, 1–2 cm. wide, the upper abruptly linear-lanceolate. — Lake Daviumbu, Middle Fly River, common on savannahs, *Brass* 7813, in flower Sept., 1936; Gaima, Lower Fly River (east bank), open savannah-forest, occasional in thick grass cover, *Brass* 8253, in flower and fruit Nov. 1936.

BB. Plant 3–4 dm. tall, the middle cauline leaves narrower (largest lost from specimen), the upper rather abruptly smaller. — Urunu, 1500 m. alt.,[19] old artificial grass slope, *Brass* 4821, in flower and fruit Aug., 1933.

[18] Trans. Amer. Philos. Soc. II. **24**: 353. 1935.

[19] Original altitude-record of 2840 m. corrected in Brittonia **3**: 95. 1938.

AA. Inflorescence glabrous, except for minute ciliation of bracts, bractlets and calyx-lobes; plant 5–6 dm. tall, the middle cauline leaves small, narrow, 2–3 cm. long, 0.3 cm. wide, leaves gradually passing from the short wide lower to the subulate upper ones. — Tarara, Wassi Kussa River, Western Division, *Brass* 8571 and 8597, in flower Dec., 1936.

9. **Striga** Loureiro

Apparently the species of this genus show striking contrasts in color, although this is a matter not considered in the old descriptions. Thus, Schlechter's account terms the flowers of *S. lutea* cinnabar-red, of *S. Wallichii* snow-white or very pale yellowish, and of *S. multiflora* brilliant orange-yellow, the last on drying becoming dark bluish gray. L. J. Brass gives the color of the present two species as white and as purple, by the latter of which I suspect violet is really intended. There is urgent need to discover the colors pertaining to the species first described from northeastern Australia, so as to make more use of color-distinctions in this critical group. The following species collected by Brass are closely akin to *S. multiflora* Benth., also originally from northeastern Australia.

Corolla white, 12–15 mm. long, externally pubescent, the throat distinctly wider than the tubes; leaves 2–4 cm. long, the middle ones longer and somewhat spreading. 1a. *S. curviflora*

Corolla violet ("purple"), 7–8 mm. long, externally puberulent, the throat ill-defined though slightly wider than the tube; leaves 1.5–2.5 cm. long, all ascending or the middle ones hardly spreading. 1b. *S. parviflora*

*1a. **S. curviflora** (R. Brown) Bentham, Compan. Bot. Mag. **1**: 362. 1835.

Buchnera curviflora R. Br., Prodr. **1**: 438. 1810.

Gaima, east bank of lower Fly River, open savannah-forest, common in thick grass cover, *Brass* 8256; flower white.

As originally described by Robert Brown this was distinguished from the following by its more elongate and spreading leaves, the retuse upper lip of the corolla, and the upper being only 1/3 the length of the lower corolla-lip. To this Bentham added that the corolla is pubescent. With this characterization our plant agrees except that the upper is about ½ - ⅔ as long as the lower corolla-lip.

In his paper of 1835 Bentham added a related species, *S. multiflora* (p. 313), differing especially in its corolla being glabrous, the upper only little shorter than the lower lip, and in its "long almost decumbent habit." Later, in his Flora Australiensis (**4**: 516. 1869), the two were contrasted wholly as to the corolla-size and -proportions, the corolla of

S. multiflora being "glabrous glandular or pubescent." By this new classification our plant would be *S. multiflora*, but I suspect that actually the pubescence of the corolla externally will prove of sufficient significance to break such an alignment.[20] Accordingly, I am holding our specimen, remarkable for its hairy corolla, as more probably a form of *S. curviflora*.

*1b. **S. parviflora** (R. Brown) Bentham, Compan. Bot. Mag. **1**: 362. 1835.

Buchnera parviflora R. Br., Prodr. **1**: 438. 1810.

Port Moresby, Central Division, open savannah-forest, common on stony hillsides, alt. 200 m., *Brass* 8780; flowers purple.

As originally described by Robert Brown this was distinguished from the foregoing by its strict leaves, the entire upper lip of the corolla, and the upper being ½ the length of the lower lip or slightly more. To this Bentham added that the corolla is pubescent. With this characterization and his subsequent statement of corolla-size,[21] our plant agrees exactly.

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[20]Probably the plant of Northeastern New Guinea, identified by Schlechter as *Striga multiflora* Benth. but said to have bright orange-yellow flowers, will prove to be some other species, as yet undescribed.

[21]Fl. Austral. **4**: 516. 1869.